Remarks

Applicant respectfully requests reconsideration of the application.

Claims 15-16 are rejected under 35 U.S.C. Section 112, second paragraph, as being indefinite. The intended relationship between the computer and the code in claim 15 has been made explicit in claim 15, namely, that the computer executes the code.

Claims 1-2, 8, 10, 12 and 22-23 are rejected under 35 U.S.C. Section 102(e) as being anticipated by U.S. Patent No. 6,834,344 to Aggarwal.

Claims 3, 5, 9, 13 and 17-20 are rejected under 35 U.S.C. Section 103(a) as being unpatentable over Aggarwal in view of U.S. Patent No. 5,488,223 to Austin et al. ("Austin").

Claims 4 and 15-16 are rejected under 35 U.S.C. Section 103(a) as being unpatentable over Aggarwal in view of U.S. Patent No. 6,064,764 to Bhaskaran et al.

Claims 21 and 24 are rejected under 35 U.S.C. Section 103(a) as being unpatentable over Aggarwal in view of U.S. Patent 6,243,480 to Zhao.

Applicant thanks the Examiner for the courtesy of conducting an in person interview with the undersigned attorney for applicant, Joel Meyer, on June 6, 2006. In the interview, Mr. Meyer discussed the distinctions between the claims and Aggarwal. No agreement was reached. Mr. Meyer indicated that he would consider clarifying amendments. This amendment includes some clarifications and additions to dependent claims that further distinguish them over the cited art. Upon further study of Aggarwal, Applicant concluded that it was not necessary to further amend the claims because of the deficiencies of the teachings in Aggarwal with respect to several aspects of the claims as set forth below.

Claims 1-2, 8, 10, 12 and 22-23 are patentable over Aggarwal

Claim 1

As indicated in the interview, Applicant believes that Aggarwal does not teach all of the elements of claim 1 prior to the above amendment. However, in the interest of advancing prosecution, Applicant has included some clarifying language into claim 1.

Prior to discussing claim 1 further, it is useful to review Aggarwal. In the embedding process, Aggarwal begins by computing a message digest N for an image.

See col. 6, lines 55-62. In one embodiment, the digest is derived from DCT coefficients. This digest N is then embedded in the image I using a robust invisible watermark algorithm, or alternatively, it is embedded as a visible watermark. Col. 6, lines 59-64. The basic premise of this approach is that modification of the image will change the value of the message digest N in a suspect image I' but will not prevent accurate recovery of the digest N' that has been embedded into the suspect image I'.

Aggarwal determines authenticity by computing N again for an image I' suspected of being modified, and then comparing it to N', which is extracted from the robust watermark in the image I'. If N' is similar to N, then the image is deemed authentic. Otherwise, it is deemed not to be authentic. Aggarwal is silent on using this authentic/not authentic test to measure print quality.

Assumption of Aggarwal's method are that embedding the digest will not change the value of the digest N, and the number N', which is carried in the robust watermark will be accurately extracted from the suspect image. If it is not, the comparison of N and N' yields ambiguous results that are useless in authentication. In particular, the watermark detector may be unable to decode N' accurately, and therefore, the lack of similarity of N and N' may be due to failure of the watermark detector for some reason unrelated to the content in the image (e.g., the failure to synchronize with the orientation of the watermark signal) even if the digest is exactly the same in both the original and suspect image. Also, the similarity of N and N' may be indicated falsely in the case where the watermark detector yields the wrong N', which matches N of a modified image.

Claim 1, in contrast, inspects printing by determining the extent to which the digital watermark is detected in the areas. This inspection is based on the watermark detection, and does not have Aggarwal's drawback of requiring accurate detection of the watermark message as a pre-condition for a further comparison with a digest. Instead, it relies on the extent of detection in the areas of the image. As further clarified, claim 1 further recites: "including separately determining the extent of detecting a watermark signal in a plurality of distinct areas." Aggarwal derives the digest by quantizing DCT coefficients from different blocks, but this is not equivalent to the cited claim language because computing the digest is a separate and unrelated function from detecting a

watermark. Moreover, the comparison of the digest with the watermark does not suggest:
"separately determining the extent of detecting a watermark signal in a plurality of
distinct areas" because comparison in Aggarwal occurs after the watermark is
successfully detected and the message N' accurately decoded from it.

Finally, Aggarwal is silent with respect to whether his determination of authentic
vs. non-authentic provides any indication of the print quality.

Claim 2

Claim 2 further distinguishes Aggarwal. Aggarwal does not provide details
regarding how the watermark is detected, but instead, just assumes that robust watermark
detection will yield an accurate representation of the embedded digest N'. In contrast,
claim 2 recites a specific process of measuring watermark signal strength not suggested
in Aggarwal.

Claim 8

Aggarwal fails to teach: "reading said watermark signal... to compute a measure
of the digital watermark signal strength." As noted, Aggarwal fails to give details of how
to extract N' from an embedded robust watermark and merely assumes that the N' will be
accurately recovered, regardless of whether the watermark strength is strong or weak.
The Examiner has cited Aggarwal's process of comparing the extracted watermark
message N' with a digest N, which is a value of DCT coefficients. But, this comparison
process is not a process of reading the watermark signal to compute a measure of digital
watermark signal strength because comparison can only happen after accurate recovery
of the watermark and the DCT coefficients of the digest are unrelated to the robust
watermark signal (by necessity as explained further in this response). In Aggarwal, there
is no relationship between the value of the DCT coefficients that form the digest N and
the strength of the watermark. As such, the comparison of the data carried in the robust
watermark, namely the digest N', with DCT coefficients N does not provide a measure of
watermark signal strength as claimed.

Assuming for the sake of argument that Aggarwal embedded a watermark into the
image by modifying the DCT coefficients, this approach would destroy the effectiveness
of Aggarwal's authentication scheme because it would change the digest, such that it

would not be discernable whether the digest changed due to malicious modifications of the image or due to changes made to the coefficients to embed N. Therefore, in order for Aggarwal's technique to be effective, the watermark signal in the image has to be unrelated to the digest (and thus the DCT coeffiecents) to avoid unwanted distortion of the digest by the mere act of embedding the watermark.

Further, Aggarwal fails to teach or event suggest; "determining quality of said printing from the measure of the digital watermark signal strength."

Claim 10

Claim 10, as amended, further clarifies that "the measure of the digital watermark strength comprises a measure of the signal at the selected spatial frequencies." As noted above, Aggarwal's approach of determining whether certain DCT coefficients have changed is not a measure of digital watermark strength because Aggarwal's watermark must not change these coefficients in order for the authentication scheme to work.

Claim 12

The cited passages of Aggarwal for claim 12 (Fig. 3(201-205), and col. 6, lines 48-51 and 55-59) relate to Aggarwal's process for deriving a hash from DCT coefficients in an image. DCT coefficients correspond to 8 by 8 pixel blocks. The hash is converted into a 160 bit message called a digest, N. These cited passages are unrelated to how the digest N is ultimately embedded into the image. Aggarwal fails to provide details regarding how the digest N is embedded, other than referring to U.S. Patent No. 5,825,892 at col. 5, line 19, in the context of a different embodiment. Therefore the cited passages fail to anticipate claim 12.

Claim 22

Aggarwal does not teach the use of strength of the watermark signal in areas where the watermark is redundantly embedded as a measure of print quality as claimed. Regarding the element of "redundantly embedded," the Examiner has cited portions of the specification relating to how the digest is derived, which is unrelated to how the digest is embedded. As noted previously, Aggarwal has to embed the digest in a manner

that is does not impact the digest (e.g., the value of DCT coefficients) in order for the authentication scheme to work properly. Thus, the comparison of the digest with the digest extracted from the watermark is unrelated to a measure of strength of the watermark signal as claimed.

Claims 23

Claim 23 is even further distinguishable from Aggarwal. Aggarwal's use of DCT coefficients to form a digest and the subsequent comparison of that digest with the watermark does not teach anything about measuring the strength of the watermark as claimed, and in particular, does not teach "strength measured as a function of spatial frequencies that have been modified to embed the digital watermark." Aggarwal must not change the DCT coefficients to embed the watermark for fear of changing the value of the digest, and thus, inadvertently causing the image to be not authentic merely by the act of embedding the watermark.

Claims 3, 5, 9, 13 and 17-20 are patentable over Aggarwal and Austin

Austin does not teach the missing elements from Aggarwal. Therefore, even when combined, the references do not teach all of the elements of these claims. In addition, there is no motivation to combine these reference to make the invention of claims 3, 5, 9, 13, and 17-20.

Claim 5

The combined teachings specifically do not suggest: "wherein said label is evaluated based on strength of watermark signal detected in the areas as the measure of the quality of the printing."

Claim 17

The combination of Aggarwal and Austin fail to teach: "means for determining an extent to which the watermark signal is detected in the areas as a measure of print quality of said labels," in combination with the other claim elements. Aggarwal's comparison of a digest N with an extracted watermark message N' does not determine the extent to which the watermark signal is detected in the areas as a measure of print quality of the labels. Aggarwal assumes that N' will be recovered accurately so that comparison

with N will indicate whether the digest (or certain DCT coefficients for example) have been modified. The DCT coefficients used as the digest are distinct from Aggarwal's watermark signal as noted previously.

Other distinctions of the claims in this group are not belabored here to avoid unnecessarily lengthening this response.

Claims 4 and 15-16 are patentable over Aggarwal and Bhaskaran
Claim 4

Bhaskaran does not teach the elements missing from Aggarwal, and therefore, the combined teachings do not teach all of the elements of claim 4.

Claim 15

Aggarwal fails to teach or suggest: "code for examining magnitude of the digital watermark signal in said areas as a measure of quality of said printing" in combination with the other elements of claim 15. Aggarwal does not teach that the message N embedded in the robust watermark in Aggarwal is related to the magnitude of the watermark signal used to carry that message in the image. In fact, as noted in this response, Aggarwal must make the watermark signal used to carry N separate from the digest to avoid the changes to the image due to embedding the watermark signal from inadvertently modifying N. Bhaskaran does not provide the missing elements from Aggarwal, and therefore the combination does not teach all of the elements of claim 15.

Claim 16

Claim 16, as amended, further distinguishes the claim from Aggarwal and Bhaskaran.

Claims 21 and 24 are patentable over Aggarwal and Zhao

Zhao does not teach the elements missing from Aggarwal, and therefore, the combination of Aggarwal and Zhao do not teach all of the elements of claims 21 and 24.

In view of the foregoing, the claims should be in condition for allowance over the cited art.
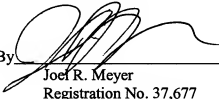
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